

Project Details

ROSES ID: NRA-03-OSS-01

Selection Year: 2004

Program Element: Independent Investigation: LWS

Project Title:

Stars as Suns: Unraveling Long-term Solar Variability by Stellar Dynamo Modeling

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Summary:

We propose dynamo simulations of stars that are very similar, but not identical to the Sun. The main goal is to better understand the nature and evolution of the solar dynamo by studying how its main characteristics (period, activity level), as simulated with the well tested mean field dynamo code, vary within the parameter space close to the observed or assumed input parameters and profiles that reproduce the solar dynamo, and by comparing these results with the periods, X-ray and Ca HK activity levels, that are known for various Sun-like stars. In particular we will carry out simulations for both the Babcock-Leighton (surface) and the mean field (convection zone) α -effect to determine which one reproduces better the dynamo periods and activity levels of Sun-like stars, and thereby is the more likely mechanism operating in stellar (and solar) dynamos. The relevance of this work is that a better understanding of the evolution of the dynamo mechanism will enable us to make more confident predictions for the Sun's variability spanning from solar cycle-like timescales to stellar evolutionary timescales. This will provide more reliable input for space weather and Earth's climate forecasters and is relevant for understanding the long term evolution of the Sun's magnetic field and its subsequent effect on the Sun-Earth connection. The proposal includes partial support for a postdoc and an undergraduate, and full support for a graduate student. It is our intention that this project will constitute the thesis research for the graduate student.

Publication References:

Summary: "

Reference: Petrus Martens / Montana State University-Bozeman -Stars as Suns: Unraveling Long-term Solar Variability by Stellar Dynamo Modeling